UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2007/2008

October/November 2007

EEM 321 – MANUFACTURING MANAGEMENT AND TECHNOLOGY
[Pengurusan Dan Teknologi Pembuatan]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of NINE pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat bercetak sebelum anda memulakan peperiksaan ini].

This paper contains SIX questions.

[Kertas soalan ini mengandungi ENAM soalan].

Instructions: Answer **FIVE** (5) questions. If a candidate answer more than five questions, only the first five answered will be examined and awarded marks.

***[Arahan:** Jawab **LIMA** soalan. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah].*

Answer to any question must start on a new page.

[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru].

You may answer a question either in bahasa Malaysia or in English.

[Anda dibenarkan menjawab soalan sama ada dalam bahasa Malaysia atau bahasa Inggeris].

1. (a) Apakah yang dimaksudkan dengan 'industri sekunder'? Beri satu contoh industri sekunder dan nyatakan barangan yang mungkin dihasilkan oleh industri tersebut.

What is meant by 'secondary industry'? Give an example of such an industry and state the products that might be manufactured by this particular industry.

(30 marks)

(b) Beri pecahan bagi proses pembentukan. Huraikan salah satu daripada pecahan tersebut.

State the various categories for the shaping process. Describe one of them.

(30 marks)

(c) Terangkan maksud 'keupayaan pemprosesan teknologikal'.

Explain the meaning of 'technological processing capability'.

(40 marks)

2. (a) Terangkan mengenai 'susunan posisi tetap' bagi kes pengeluaran kuantiti rendah.

Explain the 'fixed position layout' for the case of low quantity production.

(30 marks)

(b) Bilakah 'pengeluaran talian aliran' sesuai untuk dipraktikkan?

Under what conditions is the 'flow line production' suitable to be used?

(30 marks)

(c) Bilakah 'teknologi berkumpulan' sesuai untuk dipraktikkan?

When is 'group technology' applicable?

(40 marks)

3. (a) Senaraikan dan huraikan komponen berikut bagi sistem pembuatan suai ubah.

List and describe the following components of a flexible manufacturing system.

(i) komponen perkakasan
hardware components

(ii) komponen perisian
software components

(40 marks)

(b) Bagaimanakah syarikat pembuatan menambah nilai sesuatu bahan?

How do manufacturing companies add value to a given material?

(60 marks)

4. (a) Jelaskan dengan bantuan lakaran, teknologi pencontoh-sulungan pantas yang dikenali sebagai Pembuatan Objek-Berlamina.

Explain with help of sketches, the Rapid Prototyping technology called Laminated-Object Manufacturing (LOM).

(30 marks)

(b) Bincangkan tentang satu (1) kelebihan dan dua (2) masalah berkaitan teknologi pencontoh-sulungan pantas sekarang yang menggunakan penambahan bahan.

Discuss on one (1) advantage and two (2) problems of with the current material addition rapid prototyping technologies.

(15 marks)

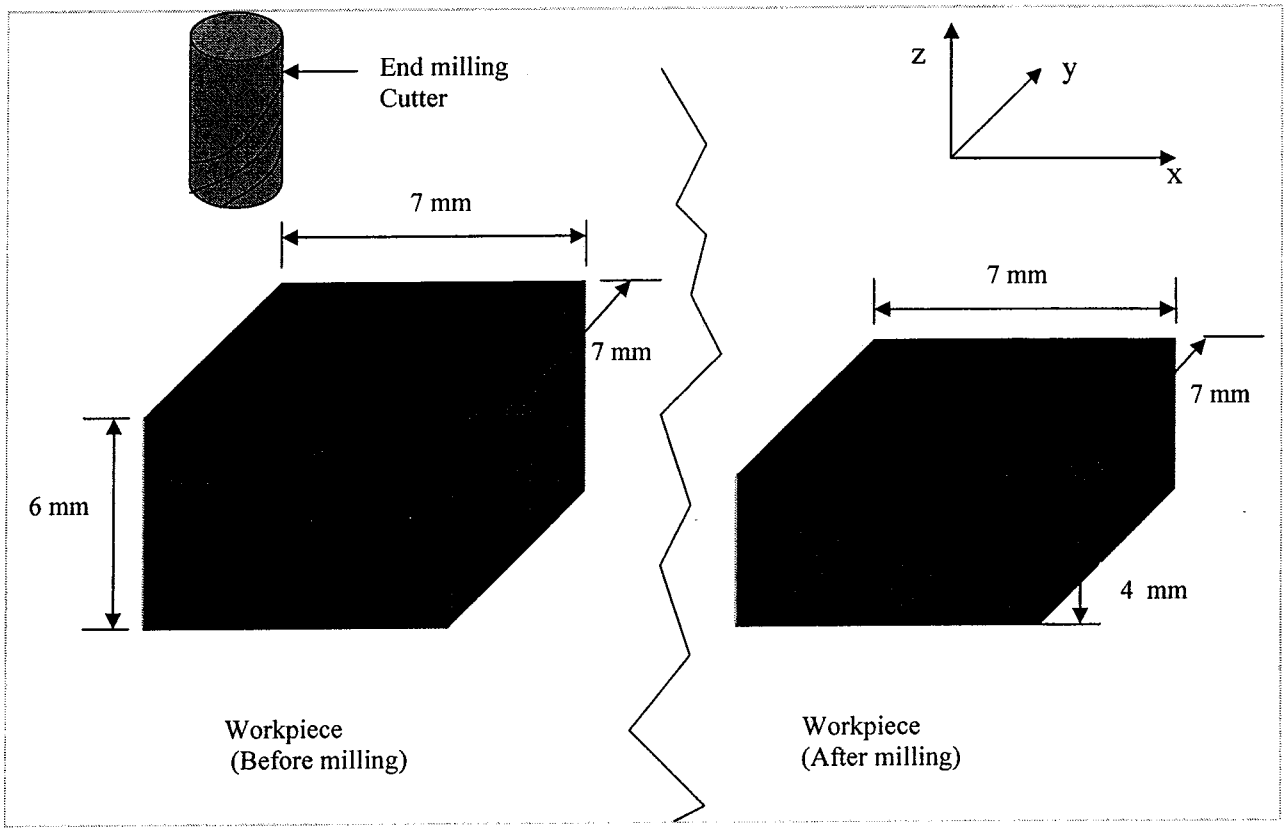
(c) Nyatakan jujukan proses yang terlibat dalam fotolithografi.

State the sequence of processes involved in photolithography.

(15 marks)

(d) Satu plat yang mempunyai dimensi seperti dalam Rajah 4(a) akan difabrikasi menggunakan satu mesin pelorek CNC. Pemotong terpepat bergarispusat 2.5 mm digunakan.

A plate with dimensions as shown in Figure 4(a) is to be fabricated using a CNC milling machine. The profile will be milled by using a 2.5 mm diameter end-milling cutter.



Rajah 4(a)
Figure 4(a)

(i) Lakarkan laluan yang perlu diikuti oleh pemotong untuk memperolehi profil tersebut (pandangan atas).

Sketch the cutter path that the cutter has to follow to obtain the required profile (top view).

(ii) Tulis aturcara di dalam kod-G dan kod-M berdasarkan Jadual 4(a).

Write the program in G-codes and M-codes based on Table 4(a).

(40 marks)

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Jadual 4(a)
Table 4(a)

Codes	Description
G01	Linear Interpolation
G02	Circular Interpolation CW
G20	Input in Inches
G21	Input in Millimeters
G28	Return to Reference Point
G90	Absolute Zero
G91	Incremental Command
G98	Return to Initial Point in Canned Cycle
M03	Spindle Forward
M05	Spindle Stop
M06	Auto Tool Changer
M30	Program Reset and Rewind

5. (a) Nyatakan langkah-langkah yang terlibat dalam penghasilan litar terkamil.

State the processing steps in the production of integrated circuit.

(5 marks)

(b) Jelaskan tentang proses penghasilan Silikon Gred Elektronik.

Explain the process of the production of Electronic Grade Silicon.

(15 marks)

(c) Terangkan dengan bantuan lakaran, proses pembikinan peranti logik semikonduktor logam oksida saluran n (NMOS). Anda mesti masukkan proses pelogaman dan salutan akhir.

Describe with the help of sketches the process of fabrication n-channel metal oxide semiconductor (NMOS) logic device. You must include metallisation and final coat processes.

(60 marks)

(d) Bandingkan dua (2) proses punaran kering termasuk penjelasan tentang mekanisma punaran dan kelebihannya.

Compare two (2) dry etch processes including description of their etch mechanism and their advantages.

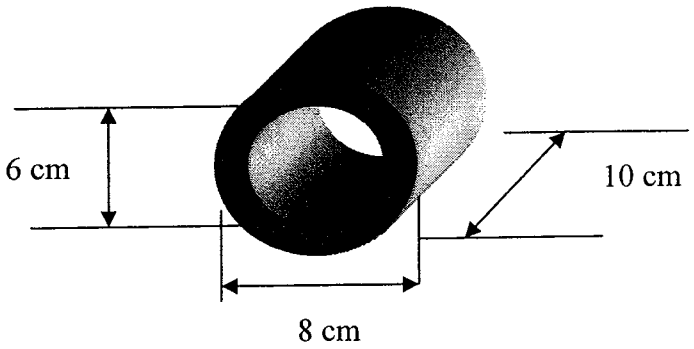
(20 marks)

6. (a) Contoh sulung bagi sebuah tiub seperti dalam Rajah 6(a) dibina menggunakan stereolithography. Kirakan masa untuk menyiapkan contoh sulung tersebut.

Prototype of a tube shown in Figure 6(a) is to be fabricated using stereolithography. Calculate the time required to build the part.

Berikut adalah spesifikasi contoh sulung dan mesin:
The followings are the specifications of the prototype and the machine:

Ketebalan lapisan *Thickness of the layers*	= 0.50 mm
Garis pusat sinar laser *The diameter of the laser beam*	=0.25 mm
Halaju imbasan sinar laser *Scanning speed of the laser beam*	=500 mm/s
Time required to lower the platform	= 20 s



Rajah 6(a)
Figure 6(a)

(30 marks)

(b) Terangkan proses pemesinan-mikro untuk membentuk satu julur.

Explain the process of surface micromachining to form a cantilever.

(30 marks)

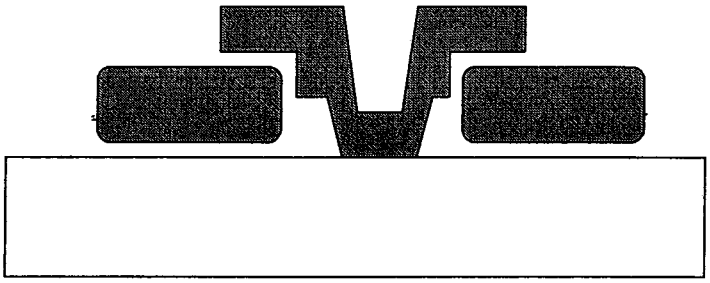
(c) Terangkan tiga perbezaan antara pemprosesan litar terkamil dan pembikinan peranti mikro dalam sistem mikroelektro-mekanikal.

Explain three differences between the processing of Integrated Circuits (ICs) and the fabrication of microdevices in Microelectro-mechanical system (MEMS).

(15 marks)

(d) Rekabentuk proses fabrikasi menggunakan proses-proses lapisan silikon untuk satu galas pin pusat yang ditunjukkan dalam Rajah 6(b).

Design fabrication processes using silicon layer processes for a centre-pin bearing shown in Figure 6(b).



Rajah 6(b)
Figure 6(b)

(25 marks)

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